REMARKS

Claim Rejection based upon 35 U.S.C. §102(b)

Claim 1, 5, 8 and 17 have been rejected under 35 U.S.C. §102(b), as being anticipated by Moffett (US 6132625). The arguments presented in the previous office action have not been defined in the claims. Furthermore, none of the conditions such as pH and temperature are stated in the instant specification to add weight to such an argument.

Further Claims 1-17 has been rejected under 35 U.S.C. §103(a), as being unpatentable over Moffett (US 6132625) in view of Levic et al. and further in view of Barajas et al.

The examiners "response to arguments" states that the argument against Moffett is based upon contradictory statements with regards to the streams containing fats and oils, protein, gluten, fiber and germ. The Examiners interpretation is not correct because Moffett also relies on the addition of an anionic inorganic colloid followed by the addition of cationic polyacrylamide to a biosolids stream. Moffett teaches the use of a cationic organic polymer followed again by an anionic organic colloid and then a cationic organic polymer. In each of these cases the anionic inorganic colloid is used as a bridging/attachment mechanism for the cationic flocculants. Moffett does not teach the use of an anionic polymer alone or an anionic polymer in combination with a cationic organic polymer resulted in desirable results.

A couple of terms that are sometimes interchangeably used in industry are "biosolids" and "biological solids". Understanding the true definition of each is important to providing some clarity to the issue and interpretation of the work we have presented and those defined by Moffett. The Moffett patent deals with 'biosolids" in this patent they are treating a wastewater streams from a food processing plant which may be selected from the list provided in Column 3 lines 5 to 21(Moffett Patent) they are not discussing treating/concentration of the process stream, but rather the wastewater stream containing residual fats, oils and greases, and protein. The waste residues of the processing of chickens, pigs, soybeans, food products, etc. before the water stream is discharged to a municipal wastewater treatment facility.

In our invention there is no starch and sugar present as they have been recovered/removed for conversion to ethanol in a prior unit operation in the dry mill. The sole purpose of this type of plant is to convert corn to ethanol.

The discussion about the insoluble proteins present in the process stream notes that they change in characteristics and charge based upon the physical parameters in which they are present (i.e. system pH, temperature, etc) as a result what one may expect as a flocculant of choice for a given application based upon standard waster water treatment practices is not always the case.

Biosolids is a term used by the water treatment industry that refers to treated sludge. Sludge, or "biosolids," are the byproduct of the treatment of domestic and commercial wastewater or sewage in a wastewater treatment plant. To create biosolids, these residuals are further treated to reduce pathogens and vector attraction by any of a number of approved methods. Nevertheless, toxic chemicals, such as PCBs, dioxin, and brominated flame retardants, remain in the "treated" sludge, as there is no technology available to remove these and tens of thousands of other chemicals from sewage sludge, the byproduct of wastewater treatment.

Depending on their level of treatment and resultant pollutant content, biosolids can be used in regulated applications ranging from soil conditioning to fertilizer for food or non-food agriculture to distribution for unlimited use. The term biosolids was formally recognized in 1991 by the Water Environment Federation (WEF). WEF, founded in 1928, is a not-for-profit technical and educational organization with members from varied disciplines (e.g. wastewater treatment operators and engineers) who work for the preservation and enhancement of the global water environment. WEF

was formerly known as the "Federation of Sewage Works Associations." Biosolids is the term created in 1991 by the Name Change Task Force at WEF to differentiate raw, untreated sewage sludge from treated and tested sewage sludge that can be beneficially utilized as soil amendment and fertilizer. The term "biosolids" also helps make the land application of processed sewage sludge more acceptable to the public. The proposal to create a "Name Change Task Force" originated with Peter Machno, manager of Seattle's sludge program, after protesters mobilized against his plan to spread sludge on local tree farms. In June of 1991, the Name Change Task Force finally settled on "biosolids," which it defined as the "nutrient-rich, organic byproduct of the nation's wastewater treatment process."
* Source: Wikipedia contributors. Biosolids [Internet]. Wikipedia, The Free Encyclopedia; 2008 Oct 2, 07:00 UTC [cited 2008 Oct 31]

Biological Solids - Solids in a "biological process**", a process of a living organism (either plant or animal). Biological processes are made up of any number of chemical reactions or other events that results in a transformation.

Regulation of biological processes occurs where any process is modulated in its frequency, rate or extent. Biological processes are regulated by many means; examples include the control of gene expression, protein modification or interaction with a protein or substrate molecule.

Biological processes are often regulated by genetics. In some cases, Mutation may lead to interruptions to a biological process. Viruses have a set of biological processes by which they reproduce.

Biological processes include:

Cell adhesion, The attachment of a cell, either to another cell or to an underlying substrate such as the extracellular matrix, via cell adhesion molecules.

Cell signaling or attachment between one cell and another cell, between a cell and an extracellular matrix, or between a cell and any other aspect of its environment.

Morphogenesis, cell growth and cellular differentiation

Cell physiological process, the processes pertinent to the integrated function of a cell.

Cell recognition, the process by which a cell in a multicellular organism interprets its surroundings.

Physyological process, those processes specifically pertinent to the functioning of integrated living units: cells, tissues, organs, and organisms.

Pigmentation, Reproduction, Digestion

Response to stimulus, a change in state or activity of a cell or an organism (in terms of movement, secretion, enzyme production, gene expression, etc.) as a result of a stimulus.

Interaction between organisms. the processes by which an organism has an observable effect on another organism of the same or different species.

Also: fermentation, fertilisation, germination, tropism, hybridisation, metamorphosis, photosynthesis, transpiration.

** Source: Wikipedia contributors. Biological process [Internet]. Wikipedia, The Free Encyclopedia; 2008 Sep 16, 09:56 UTC [cited 2008 Oct 31].

An Example - For instance the production portion of a food plant may be comprised of a number of a *biological process* used to convert the starting raw materials into a desired end product. Water is a primary component or mechanism used in many of the plants as a carrier/medium to aid in processing and convey the material through the plant and the various processes. Once the raw material and final product have been extracted from this stream the water can either be reused or discarded. In many cases the water picks up contaminants during processing that make it no longer usable as a carrier in the plant. The water "aqueous stream" will then be sent to a wastewater treatment operation, which is a *biological process* where it is processed to two components clean water and *biosolids*. The two components are separated, the water is discharged to a stream or POWT and the *biosolids* depending upon their composition are sent to a landfill or may be land applied.

The current invention is dealing with a process stream in the dry milling plant at the point where fractionation of the corn kernel occurs. In this case process stream the starch component of the corn kernel has been removed from the stream by conversion and extraction techniques. At this point in the process the remaining stream is typical referred to as whole stillage or thick slop. This is the term used by the industry for all of the remaining insoluble fractions of this process stream. There is also a small soluble protein fraction present in the stream referred to as syrup, which we do not impact in our treatment. With the polymers we only go after and grab on to insoluble components of the process stream at the pH in the range of 3 to 6. Outside this pH range the protein changes or denatures and is not usable for recovery into a feed source. The soluble fraction in this stream will ultimately be sent to the wastewater treatment process or an evaporation process for treatment to enable discharge. The insoluble fraction we are treating or recovering has some interesting properties in that pH, temperature and composition play a significant role in chemistries and the specific properties of those that work in this application.

The primary goal is to improve the solids liquids separation process and as a result improve the throughput and the efficiency of the particular unit operation in the separation process. In this process the pH of the stream is in the processing range of 3.0 to 5.0, the temperature is 160 to 200^0F and the stream typically contains 7% to 18% by weight suspended solids.

There are also some significant differences in the characteristics and composition of the protein present in two streams. Proteins are large organic compounds made of amino acids arranged in a linear chain and joined together by peptide bonds between the carboxyl and amino groups of adjacent amino acid residues. The sequence of amino acids in a protein is defined by a gene and encoded in the genetic code. Although this genetic code specifies 20 "standard" amino acids plus selenocysteine and - in certain archaea - pyrrolysine, the residues in a protein are sometimes chemically altered in post-translational modification. This can happen either before the protein is used in the cell, or as part of control mechanisms. Proteins can also work together to achieve a particular function, and they often associate to form stable complexes.

The solubility of proteins in aqueous buffers depends on the distribution of hydrophilic and hydrophobic amino acid residues on the protein's surface. Hydrophobic residues predominantly occur in the globular protein core, but some exist in patches on the surface. Proteins that have high hydrophobic amino acid content on the surface have low solubility in an aqueous solvent. Charged and polar surface residues interact with ionic groups in the solvent and increase solubility. Knowledge of amino acid composition of a protein will aid in determining an ideal precipitation solvent and method. (Wikipedia contributors. Protein precipitation. Wikipedia, The Free Encyclopedia. August 16, 2008, 04:16 UTC.)

Due to the nature of the stream as described and identified in Moffett the protein value of the soluble material in the aqueous stream as treated is 3% or less by weight. The protein value of the stream discussed in the current invention is in the range of 10 to 20% by weight protein and is the insoluble fraction derived from corn dry grind ethanol operations. There are also significant differences in the protein composition of many of the grains and corn this can best be demonstrated by persons with food allergies such as Celiac disease, a wheat protein/gluten intolerance. While there is some sharing of terminology the structure/composition of the protein that comprise the "gluten from corn" is much different than "gluten from wheat".

Moffett Patent

The Examiner rejected the arguments we made in our response to the prior office action based upon citations from Moffett, et al. US 6,132,625. The examiner states "that Moffett teaches that coagulants and flocculants used, the anionic polymers, are for starches and grains, for food processing plants that include plants for grains, for breweries, distilleries and wineries, wherein the biosolids are those that include sugars, starch and other carbohydrates in addition to protein, fats and oils. This shows the application of these polymers for a wide array of processes. These processes also include grain stillage solids."

This is incorrect the Moffett patent shows something quite different. Each of the 16 examples cited in the Moffett patent as well as the claims depend on the use of an anionic inorganic colloid, which is identified by name as colloidal silica, which is not an anionic polymer. There are no demonstrated examples, no claims and no references in the body of the patent text.

The definition of colloidal silica the anionic inorganic colloid identified in the patent is defined as follows in The chemistry of Silica, Ralph K. Idler 1979) "The definition of a colloidal silica is a stable dispersion of discrete particles of amorphous silica". There is also a reference to the use of microgels and some substituted microgels and their use and functionality. The silica microgels are also used as an anionic inorganic colloid in this application. Once the aqueous stream has been treated with the anionic inorganic colloid a cationic polymer is added. In some cases the cationic polymer (flocculant or coagulant) is added first, followed by the anionic inorganic colloid and then a cationic polymer (flocculant) is added. There is no reference/example or scenario to the use of an anionic polymer alone.

Of the 16 Examples in the patent one if from a Cornstarch application, one is from Soybean and the remainder are from the same poultry processing application. There are no examples relating to gluten processing, stillage processing, fiber processing or the processing of brewery streams. There is no specific example or reference to dry grind ethanol production. There is no specific reference to corn wet milling only a very high level and extremely generic reference to the wet milling of starches and grains.

Moffet relates to treating biosolids in a wastewater treatment capacity in plants in a number of different food processing applications. In these applications any water stream from the plant that cannot be reused or recycled in the process are combined and processed in an industrial wastewater treatment operation. In some of these plants there is a primary wastewater treatment system designed to remove fats, oils, and greases prior to the stream being sent to the secondary wastewater treatment system. This is most common in slaughterhouse, poultry kill or meat processing type applications where fats, oils and grease loadings may be excessive and the concentrated solids are difficult to process. The purpose of the Secondary biological wastewater treatment operation is to remove or reduce the soluble organics from the stream to enable the plant to meet their permitted effluent quality prior to discharge of the stream to a local river, lake or municipal wastewater treatment plant (POWT). Biosolids is the term accepted and used in the industry to describe the sludge or solids produced from a biological wastewater treatment system. The aerobic digestion process and the anaerobic digestion process are two different process used to convert soluble organic matter to insoluble suspended matter. These processes are the basis for conversion of insoluble BOD to soluble BOD in all municipal and industrial wastewaters.

In biological digestion or secondary wastewater treatment, bacteria cultivated under controlled conditions utilize organic matter in the water as their food, this process produces sludge or bio-solids as a by-product of the process. In some grain processing applications or food processing applications these recovered bio-solids may be suitable for inclusion into one of the plants "co-products " animal feed.

Moffet teaches that one way to treat these bio-solids or (dead bugs) in the wastewater treatment process is to add an anionic inorganic colloid followed by a cationic organic polymer to flocculate the bio-solids. In this process the pH of the stream is typically in the range of 7.0 to 8.5, the temperature is in the range of 70 to 90^{0}F and the stream may contain as much as 0.5 to 2.0% by weight suspended bio-solids.

The aqueous stream referred to in Moffett, Col 3, lines 2-27 is a Wastewater stream containing Bio-Solids from animal slaughterhouses, animal processing plants and other food processing plants which are identified as vegetable, grain and dairy food processing. It then goes on to state that grain processing may include, plants processing soybeans, rice, barley, cheese, whey, plants for wet milling starches and grains as well as breweries, distilleries and wineries. This stream is NOT the same as the process streams we are referencing in our patent application. There is some confusion due to similarity in terminology used in both applications. Please see the attachment diagrams showing the difference between process and wastewater operations in a typical food plant.

Levic Publication:

There are in fact significant differences in what is claimed in the current invention and the Levic publication. Levic refers to the use of an inorganic material ($Ca(OH)_2$) which the authors define simply as a coagulant followed by anionic flocculant. In this paper they are treating what they define as "clear liquid" which is the process stream containing only soluble material. The insoluble material was removed in the prior filtration/processing step. The data shows that the anionic flocculant alone is not able to achieve the desired results. As a result they are dependent upon addition of the inorganic coagulant for two purposes first to add insoluble calcium to the "clear liquid" stream and second to drive the pH of the stream to 11.0.

The data from Levic clearly shows that the treatment/recovery is dependent on the addition of the calcium hydroxide to raise the pH from 3.8 to 11.0. There is no discussion whatsoever of other pH adjustment techniques. The dramatic change in pH of the process stream results in denaturing of the soluble protein in the "clear liquid". The process of denaturing the proteins results in the soluble proteins becoming insoluble. The calcium is needed to provide a physical coating for the precipitated material as they are typically kind of gummy or gelatinous and as a result are very difficult to process. The denaturing of the proteins also causes the ionic charge demand of the process stream to change and as a result the anionic flocculant is used for agglomeration of the precipitated solids.

Barajas Patent:

The discussion in some detail of the Moffett patent and Levic publication are listed above. The differences are as follows. The Barajas patent discusses to some extent the synthesis of structured flocculants, particular to anionic flocculants. It gives one example of some flocculants that were synthesized, evaluated and tested again in a single municipal wastewater treatment application. The patent does not provide any information about the type or characteristics of flocculants that work best with certain types of solids or Biosolids applications. It's possible to develop many different polymer configurations with the same starting materials depending upon temperature, reaction rates, order of addition, raw material quality and composition. There is also a lot of "art" involved in the synthesis of polymers specifically water treatment polymers for specific applications. Often these intricacies significantly change the way the polymer molecule interacts with the solids of interest. The development of surfactant packages for inversion of the polymer in the water as it is made down to a working concentration also plays a critical role in the activity or property of the flocculant. In our case special manufacturing procedures and precautions are part of the process in order to manufacture a flocculant that meets certain quality standards for inclusion into animal feedstuffs.

CONCLUSION

Applicant thanks the examiner for their review of this matter and submit that based upon the above Remarks, all pending claims are in condition for allowance and respectfully request that a Notice of Allowance be sent for all pending claims.

Respectfully Submitted,
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